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Editorial Comment

Coronary Artery Plaque Morphology After Balloon Angioplasty*

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The present study. Autopsy means "seeing with one's own eyes" (1). In the large autopsy series reported by Farb et al. (2) in this issue of the Journal, we have the opportunity to see the morphology of coronary arteries after balloon angioplasty. As recently reviewed (3), "successful" angioplasty was associated with significant plaque disruption as well as damage to the media of any relatively normal arterial wall present. This and previous pathologic studies that have allowed us to see these arteries for ourselves have dispelled the myth that angioplasty enlarges the arterial lumen by simply compressing and redistributing the atheroma (4).

This study also reminds us that atherosclerotic plaques are quite variable in their morphology, with marked inter- and intraplaque differences in degree of calcification and inflammation and amount of dense fibrous tissue and pultaceous material (lipids and necrotic debris). Plaques differ in configuration as well. Their division into either concentric or eccentric plaques is useful, but is an oversimplification; there is a continuum of intermediate shapes. The intralesional variability in plaques cannot be overemphasized; there are marked differences in plaque content and degree of luminal narrowing from each 1 mm segment of plaque to the next. As stated by Farb et al. (2), the interplaque variability in morphology will probably gain increased relevance as options for percutaneous angioplasty proliferate (for example, atherectomy, lasers, ultrasound, stents). Choice of intervention may at least in part be determined by morphologic features of the plaque. Thus, it is important to attempt to relate plaque morphology to eventual outcome after a procedure. The authors (2) suggest that there is a greater likelihood of successful angioplasty in arteries with an eccentric plaque and with more medial damage, calcification and fibropultaceous debris.

Limitations of the study. Farb et al. (2) acknowledge some of the limitations of their study: the sample size is small and their patients are atypical. Of their 28 patients, 75% underwent angioplasty after acute myocardial infarction compared with a minority (probably about 10%) at most institutions. Plaques after myocardial infarction may be different from those in patients with stable or unstable angina, with more fissures, ulcerations, hemorrhages, thrombi, or a combination of these, already present before angioplasty. Furthermore, it is likely that many of these patients have received thrombolytic therapy before angioplasty, which could alter arterial morphology, although there are no published data to confirm this supposition. The overall angiographic success rate was only 70% compared with success rates >90% reported by most groups (5), again suggesting an unusual nature for the present study group.

In my opinion as a pathologist, the most important source of bias in the present study arises from its review of only autopsy specimens. Even if statistically significant, the findings cannot be generalized to all patients undergoing balloon angioplasty. The notion of successful angioplasty in the setting of dead patients is conceptually complex, even when speaking solely of morphologic success. For example, we do not know the cost to the patient of this successful outcome. Perhaps, the patent lumen was achieved only after numerous or lengthy arterial occlusions that critically compromised coronary flow. Perhaps the successful outcome was achieved only after very vigorous plaque disruption that resulted in distal atheroemboli. Scenarios such as these make it difficult in the early deaths (≤1 month) to separate the morphologic outcome from the patient outcome: "the surgery was successful, but the patient died." In the late deaths (>1 month) considerable plaque and arterial remodeling may have occurred in the interval between angioplasty and death.

Conclusions. Autopsy studies are absolutely essential for the evaluation of new therapeutic techniques, which in interventional cardiology are proliferating at an astounding pace. Considering that hundreds of thousands of patients have undergone coronary angioplasty worldwide, morphologic studies have probably been performed on <0.001% of arteries dilated. To date, there are not enough detailed morphologic studies of the kind reported by Farb et al. (2); however, that which we see with our own eyes at autopsy should be interpreted in that light.

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